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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/990,884	11/21/2001	Scott Patrick Campbell	08305-084001 / PBIT-0106	2239

7590

08/27/2003

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EXAMINER

BOUTSIKARIS, LEONIDAS

ART UNIT

PAPER NUMBER

2872

DATE MAILED: 08/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/990,884

Applicant(s)

CAMPBELL, SCOTT PATRICK

Examiner

Leo Boutsikaris

Art Unit

2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 14-18 is/are allowed.
- 6) ☒ Claim(s) 1,2,6-9 and 11-13 is/are rejected.
- 7) ☒ Claim(s) 3,4,6 and 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 5, 7-8, 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Fan (US 6,274,917).

Regarding claim 1, Fan discloses an image sensor device comprising (Fig. 7, line 62, col. 5 to line 14, col. 6 and lines 28-39, col. 7):

a substrate 27 of semiconductor material;

an array of sensing pixels 26 fabricated over the substrate, each photoactive pixel comprising a photoelectric conversion section to produce a pixel output representative of received radiation by the pixel (lines 28-30, col. 6); and

an optical mask layer comprising micro-lenses (not depicted in Fig. 7 but shown in Fig. 10 as elements 53) formed over the substrate in the optical path of the input radiation, said optical elements modifying a property e.g., intensity profile, of the input radiation prior to detection from the sensing pixels. Fan discloses that the lenses may be holographic (lines 36-38, col. 7).

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Regarding claim 2, the sensing pixels are formed of multiple pixel layers such as layers 35-45 fabricated on the substrate 34 (see Fig. 8, lines 36-44, col. 6) and optical mask layer 47 is formed atop of said multiple pixel layers.

Regarding claim 5, each holographic lens element in the device of Fan focuses input radiation to a corresponding sensing pixel underneath said holographic element (see Fig. 10)

Regarding claim 7, each sensing pixel has an active photoelectric conversion region 37 as well as in-pixel circuit elements such as charge transfer section 38 to convert the radiation induced charge into current or voltage.

Regarding claim 8, each focusing element 53 spatially covers only one sensing pixel (see Fig. 10).

Regarding claim 13, each holographic lens element is a diffractive element by definition.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fan in view of Clarke (US 6,057,538).

Fan discloses all the limitations of the above claim except for showing that each optical holographic element spatially covers at least two adjacent sensing pixels. Clarke discloses an image sensor device (Fig. 1) comprising an array of microlenses 32 to focus light onto sensing

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pixel(s) 22 (lines 48-65, col. 3). Each microlens element spatially covers (see Fig. 1) and is associated with a group of multiple e.g., nine pixels. It would have been obvious to one of ordinary skill in the art at the time the invention was made to fabricate the holographic elements in the image sensor device of Fan so that each holographic element spatially covers more than one sensing pixels, as taught by Clarke, since in this way the fabrication of the microlens array becomes less complicated because the pitch between elements increases (see lines 60-61, col. 3 in Clarke).

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fan in view of McLeod (US 6,020,985).

Fan discloses all the limitations of the above claim except for showing that each optical holographic element is an absorption hologram. McLeod discloses holographic means for data storage (see Abstract) and he teaches that holograms may be formed either as phase holograms (information encoded in terms of local refractive index changes) or as absorption holograms (information is encoded in terms of local absorption within the medium changes, see lines 7-19, col. 7). It would have been obvious to one of ordinary skill in the art at the time the invention was made to fabricate the holographic elements in the image sensor device of Fan in the form of absorption holograms, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for its intended use. *In re Leshin*, 125 USPQ 416. Absorption holograms, such as silver halide holograms, are the most commonly used and cheaper holograms with excellent properties in the low-diffraction efficiency region.

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Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fan in view of Feldman (US 5,923,796).

Fan discloses all the limitations of the above claim except for showing that each optical holographic element is optically reflective. Feldman discloses a semiconductor module comprising light sensor pixels 14' wherein hologram element 25' is used to direct light onto the sensor pixels (Fig. 6 and lines 19-28, col. 8). Feldman teaches that the hologram element may be a reflective hologram. It would have been obvious to one of ordinary skill in the art at the time the invention was made to fabricate the holographic elements in the image sensor device of Fan so that they operate in a reflective mode with respect to the sensing pixels, as taught by Feldman, since a device using reflective elements to direct the incident light onto the pixels comprises folded light geometry, which offers economy in the size of the device.

Response to Arguments

Applicant's arguments with respect to claims 1-3, 5-13 have been considered but are moot in view of the new ground(s) of rejection. Furthermore, regarding Applicant's assertion that a holographic optical element is entirely different from a hologram (p. 14 of Paper 10), the Examiner respectfully disagrees and notes that a hologram, in whatever form it may be, modifies a property of an incident light (change of wavelength, optical intensity, direction etc.), and hence according to Applicant's own characterization of a holographic optical element is the same as a holographic optical element.

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Allowable Subject Matter

Claims 3-4, 6, 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 14-18 are allowed.

Claims 3-4, 6, 10, 14-18 are allowed over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, regarding claims 3-4, a device wherein the optical mask layer is formed between the multiple pixel layers and the semiconductor substrate, regarding claims 6, 10, a device wherein each optical holographic element comprises a color filter, and regarding claims 14-18, a device wherein the second optical mask layer is separated from the first optical mask layer by a set of contiguous pixel layers, as set forth by the claimed combination.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Leo Boutsikaris whose telephone number is 703-306-5730.

Leo Boutsikaris, Ph.D.
Patent Examiner, AU 2872
August 14, 2003

